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4 TECHNICAL STATUS REPORT,

Contract No. NASw-870

Period Nov. 4, 1966 to Feb. 4, 1967 6

Support of the work reported herein has been provided by the Biosciences Program Division, Office of Space Sciences and Applications, Headquarters, National Aeronautics and Space Administration.

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## TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
II. PROGRAM STATUS	1
A. General	1
B. Technical	3
III. PLANS FOR THE COMING PERIOD	4
DISTRIBUTION LIST	5

## I. INTRODUCTION

The National Aeronautics and Space Administration (Biosciences Programs Division) has supported work on the development of vegetable respirometers under Contract No. NASw-870. Two systems have been designed for subsequent adaptation to space flight qualified hardware for the conduct of biorhythmicity studies using the potato tuber as the subject for the investigations. The systems are the single-cell (SPUDNIK Mark I) and multi-cell (SPUDNIK Mark II).

The potato has been chosen for use with these respirometer units because of the great amount of information pertaining to this organism and its oxidative metabolism which has been obtained during laboratory investigations conducted by Dr. Frank A. Brown, Northwestern University, and his associates, as well as other investigators in the field of biological rhythmicity.

## II. PROGRAM STATUS

### A. General

During this quarterly reporting period (Nov. 4, 1966 to Feb. 4, 1967) efforts under this program have been aimed at the completion of four single-cell units and one multi-cell respirometer. The work has progressed essentially as contemplated for the period.

In addition to the fabrication of the units noted above, a new technique for preparation of the potato specimens was tried with apparently significant improvement in the

capability for maintaining a viable specimen. The procedure used previously for preparing an eyed plug of a potato, 20 mm in diameter by 22 mm in length, is described. First, the potato is cored to obtain a specimen, or plug, of the stated dimensions. The plug was then allowed to form a new "skin" by air drying 24 to 48 hours prior to insertion in the respirometer system. This process was reasonably acceptable for specimen preparation; however, occasionally problems developed with mycotic growths which have in every case appeared to be anaerobic in nature.

In order to prevent, or alleviate, the above problem it was decided to coat the newly plugged potato specimen with paraffin. It was believed that three desirable objectives might accrue as a result of this preparation. These were:

- (1) the rapid formation of a new outer "skin" for the specimen,
- (2) reduction of specimen dehydration resulting from the air drying procedure, and
- (3) achievement of a more antiseptic preparation of the specimen by heating the cut surfaces during the hot paraffin dip.

A specimen was prepared with the paraffin dip technique and immediately inserted into the breadboard unit which has been operating during the past 18 to 20 months. On the date of this report the specimen appears to be remaining in an extremely viable condition after more than two months in the respirometer system. Thus, the new technique appears encouraging.

## B. Technical

Components for the four single-cell respirometer systems were completed during the reporting period and are now ready for assembly into operating units. It should be noted that it became necessary to design and build oxygen storage bottles and pressure regulators for both the single-cell and the multi-cell respirometers as the result of unacceptable price changes by our previous supplier. It is interesting to note that our supplier provided the original unit of this component for a price of \$1,059.00 and the next three units at \$578.00 each. Their quotation for 22 additional units, however, was \$1,278.00 each. Based on this unacceptable quotation, our make-or-buy decision was changed to design and build these units inhouse. Although precise costs cannot be identified for this inhouse development, it is certain that our costs for producing 20 units will be less than \$200.00 per unit. This saving, therefore, helped offset unexpected high costs devoted to mechanical valve development.

In addition to the inhouse development of the oxygen supply bottles with integral pressure regulators described above, an improved solenoid valve was designed and fabricated during the quarter. The valve was designed to be interchangeable between the two respirometer systems and valves have been essentially completed for the four single-cell units and the one multi-cell system. As in the case of the oxygen bottles noted above a make-or-buy decision was made to build the solenoid valves inhouse because the requisite valves were unavailable from suppliers at a reasonable price.

With the exception of a differential pressure transducer required for the multi-cell respirometer, all components to be obtained from outside sources have been received. It is expected that the transducer will be delivered in the forthcoming period.

### III. PLANS FOR THE COMING PERIOD

In the coming period it is expected that the four single-cell units will be assembled and placed in functional operation at Northwestern University and at Space/Defense Corporation. In addition, the multi-cell respirometer rework (to incorporate the solenoid valves) should be completed, the unit reassembled, and functional performance tests will be reinitiated in our laboratories.

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